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EMAP Shows Lakes and Streams Recovering in Four Regions of World

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Research Triangle Park, NC (Oct. 7, 1999)....Lakes and streams in North America and Europe are beginning to show recovery from acid rain as the result of environmental regulations and agreements to control emissions that cause acid rain, according to research led by the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program (EMAP), published in the Oct. 7 edition of the journal, *Nature.* The international study, involving investigators in nine countries, found significant declines of 1 to 6 percent per year in sulfate levels in many lakes and streams in the 1990s, resulting in recovery for some waters and expected recovery in others. Sulfate is the primary ingredient in acid rain.

To study how fast lakes and streams are recovering after many years of acid rain, the scientists examined their buffering capacity, called alkalinity, as well as the concentrations of numerous chemical components of acid rain such as sulfate and nitrate. The scientists, using special statistically-designed methods, carefully selected 205 lakes and streams in order to measure very small trends over large regions where acid rain had fallen for decades. The study included five large geographic regions in North America and three in Northern Europe.

The research was conducted by Dr. John L. Stoddard, Research Life Scientist at EPA's research facilities in Corvallis, OR, and 22 co-investigators. In all but one of the regions, Great

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Britain, significant declines in sulfate were documented, an indication of the progress of that recovery. However, only a few regions showed declines in nitrate, another component of acid rain, and these declines were relatively small. The article points out that there are many sources of nitrogen other than acid rain which makes nitrate difficult to currently use as a measure of recovery.

The research found that lakes and streams in all three regions of Europe showed recovery from acid rain which was expected in response to strong regional declines in sulfate. However, the water bodies in only one of the North American regions -- Vermont/Quebec -- experienced recovery from acid rain. Waters in the four other regions had not shown recovery, but declining sulfate levels indicate recovery may occur in the future. They are: southcentral Ontario; Adirondack and Catskill Mountains in New York; northern Michigan, Wisconsin and western Ontario; and Maine/eastern Canada. Scientists predict it may be only a matter of time for these regions to recover since the Nordic countries also experienced a delayed recovery of their lakes and streams after sulfate levels declined.

While research on acid rain recovery rates of individual lakes and streams has been conducted, this is the first large-scale study of international proportion to look at widespread recovery rates. One of the premises of the study is that if national and international attempts to control acid rain are working then the effects should be detectable in large numbers of sites in many regions.

The research by the EPA's Office of Research and Development will be incorporated into a formal report on acid rain in the year 2002 and will provide guidance to the Agency in making regulatory decisions to protect lakes and streams from acid rain.

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